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EVALUATION OF RECOMBINANT BCG AS A LIVE VECTOR FOR ORAL IMMUNIZATION OF WHITE-TAILED DEER

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Abstract: A recombinant form of Bacillus Calmette Guerin (BCG), an attenuated bovine tuberculosis bacterium (*Mycobacterium bovis*), was used to test the feasibility of oral delivery of a vaccine to deer. The recombinant BCG expresses Osp A antigen, from a spirochete (*Borrelia burgdorferi*), on its surface as a model antigen and vector for a proposed vaccine that would deliver a genetically engineered immunocontraceptive to deer.

Ten white-tailed deer (*Odocoileus virginianus*) were tested and a class B containment facility used to ensure environmental safety. Deer were immunized as follows: 2 subcutaneously injected with Osp A (antigen controls); 2 subcutaneously injected with non-recombinant BCG (BCG controls); 2 subcutaneously injected with recombinant BCG containing Osp A; and 4 orally dosed with recombinant BCG containing Osp A. Osp A antigen control deer were given a booster dose 30 days after the prime dose; other treatment groups were administered a booster dose 90 days following the prime dose.

Injected Osp A in antigen controls proved to be highly immunogenic, producing high antibody titers. Recombinant BCG proved effective as a vaccine delivery vehicle, producing antibodies to Osp A by both subcutaneous injection and oral delivery. These Osp A antibody peak titers, measured by ELISA, were 1/1600 by injection and 1/6400 by oral delivery. Control deer that were housed with orally vaccinated deer demonstrated no BCG antibody response, indicating that recombinant BCG lacks infective properties. Acid-fast staining of fecal samples showed peak BCG shedding occurred at 24 hours and was 95% complete in 72 hours. While it appears feasible to use recombinant BCG as an oral vaccine vector, a DNA probe test would need to be developed to differentiate between bovine tuberculosis and genetically altered BCG before it could be used under free-ranging conditions.